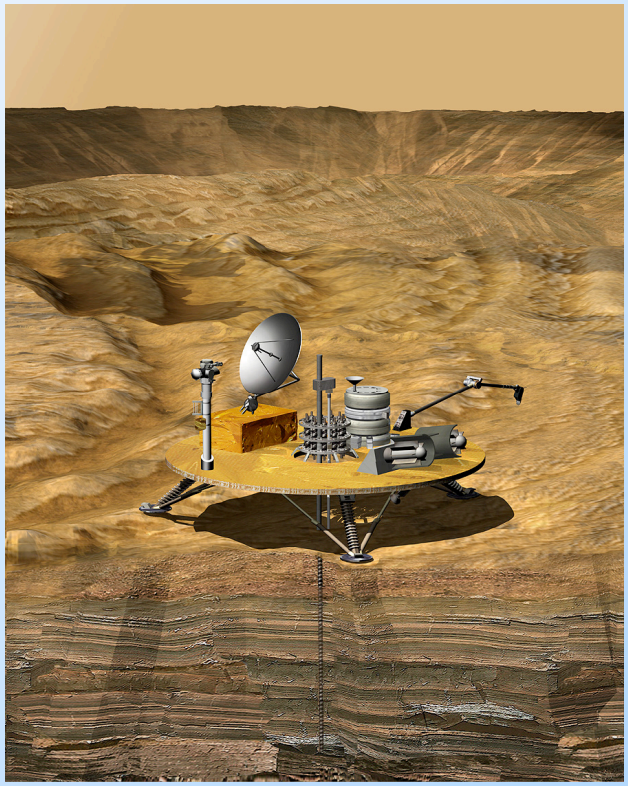
Exhibit VI

Example Precursor Mission

Mars Deep Drill, for Pathways Search for Evidence of Past Life and Explore Hydrothermal Habitats



Earliest Possible “Pathways-Compatible” Launch: May 2018

Pathway Mapping

Pathways	Science Emphasis for Deep Drill: Past Life	Science Emphasis for Deep Drill: Present Life
Search for Evidence of Past Life	**2018**	-
Explore Hydrothermal Habitats	**2018**	2018
Seach for Present Life	-	2020
Explore Evolution of Mars	-	-

Bold, red text indicates the case described in this package.

Deep Drill Level 1 Requirements (1 of 2)

Past Life Pathways

- Launch an *in situ* surface mission to Mars in the 2018 launch opportunity
  - For Explore (Ancient) Hydrothermal Habitats Pathway, site should have high probability of being ancient hydrothermal habitat
  - For Search for Evidence of Past Life Pathway, site should have high probability of past habitability
- Characterize the geology (stratigraphy, structure, chemistry) and geophysics of the shallow Martian crust at one site, particularly as it relates to interpreting past habitability
  - Determine the geological processes which have resulted in deposition, hydrothermal alteration, diagenesis, and tectonic modification of the Martian geologic record
  - Investigate the seismic and thermal characteristics of the Martian subsurface
  - Obtain visual and spectroscopic images of the local landing site to establish a context for the subsurface sample analysis and to determine the surface landing location
- Search for past life in the subsurface at one site
  - Determine the concentration of frozen and liquid water in the Martian subsurface, and its textural relationships to the non-volatile components
  - Evaluate the presence/absence of fossil biosignatures

Deep Drill Level 1 Requirements (2 of 2)

Past Life Pathways

- Obtain a meteorological record at one site
- Using a drill, bring tens of samples to the surface from various depths down to at least (10-50) m
- Land at any location between 30 deg S and 30 deg N latitude at altitudes up to 0 km (MOLA reference) where landing hazards are acceptable
  - Land within 10 km (3 sigma) of target for Search for Evidence of Past Life Pathway
  - Land within 10 m (3 sigma) of target for Explore (Ancient) Hydrothermal Habitats Pathway
- Be consistent with planetary protection category IVc
- Employ at least two methods of approach navigation
- Provide for reliable real-time telecommunications with an orbiting asset during entry, descent, landing, and post-landing critical events to obtain data essential for fault analysis, in the event of a failure, and for general performance characteristics
- For feed-forward to future missions, obtain and analyze data related to the performance of the drill, including anomalies

Mars Deep Drill: Search for Past Life

Science

- Science objectives [MEPAG #]
  - Characterize the geology (stratigraphy, structure, chemistry) and geophysics of the shallow Martian crust at one site, particularly as it relates to interpreting past habitability
    - Determine as a function of depth the geologic processes which have resulted in deposition, hydrothermal alteration, diagenesis, and tectonic modification of the Martian geologic record [18, 20, 63, 74, 79, 83, 92, 121, 134, 144]
    - Investigate the seismic and thermal characteristics of the Martian subsurface [*80*, 109]
    - Obtain visual and spectroscopic images of the local landing site to establish context for the subsurface sample analysis and to determine the surface landing location [61]
  - Search for past life in the subsurface at one site
    - Determine the concentration of frozen and liquid water in the Martian subsurface, and its textural relationship to the non-volatile components [3, 123, *56,* 4, 11, 13, 15, 10]
    - Evaluate the presence/absence of fossil biosignatures [4, 11, 13]
  - Record the meteorology at one site for at least one Martian year [34, 115, 126, 128]

- Candidate Instruments
  - Drill (10 to 50m)
  - Organics & Evolved Gas Analyzer
  - Life Detection Suite
  - Mineralogy/Chemistry Lab
  - Microimager
  - Stereo Panoramic Camera with Point Spectrometer
  - Meteorological Station
  - Drill camera
  - Downhole
    - Ice/Water Detector
    - Borehole Camera
    - Heat Flow with Thermal Experiments
    - Seismic Station

Mars Deep Drill: Search for Past Life

Science Feed Forward

- Evidence of life would alter nation's Mars program
- Confirmation of liquid water would support further search for life
- Understanding subsurface processes would allow us to more accurately predict :
  - Subsurface life detection targets
  - Possible resource availability for future human missions

Mars Deep Drill: Search for Past Life

MEPAG Investigations Addressed

MEPAG Investigations Addressed by Priority

Deep Drill Past Life

Pty	Goal I Life
1	Map 3-D distribution of water
	Location of sedimentary deposits
	Complex organic molecules in rocks and soils
2	**Subsurface water in-situ**
	Search for Fossils
	Changes in carbon inventory
3	Evidence of life forms at high-priority sites
	Timing of hydroligical activity
4	**Array of potential energy sources**
5	**Nature and inventory of organic carbon in soils and ices**
6	**Distribution of oxidants**

Pty	Goal II Climate
1	**Processes controlling present distributions of water, CO2, dust**
	Physical and chemical records of past climates
2	Stable isotope and noble gas composition of bulk atmosphere
	Stratigraphic records of past climate change at polar layers, ice caps
3	Long-term trends in the present climate
4	Rates of escape of key species from the atmosphere
5	Search for microclimates
6	Production and reaction rate of key photochemicals

Pty	Goal III Geology
1	**Present state, distribution and cycling of water**
	Configuration of Mars' interior
2	**Sedimentary processes and their evolution**
	History of the magnetic field
3	Calibrate the cratering record
	Thermal and chemical evolution
4	Igneous processes and their evolution
5	**Surface-atmosphere interactions**
6	**Large-scale vertical structure of the crust**
7	**Tectonic history of the crust**
8	Hydrothermal processes

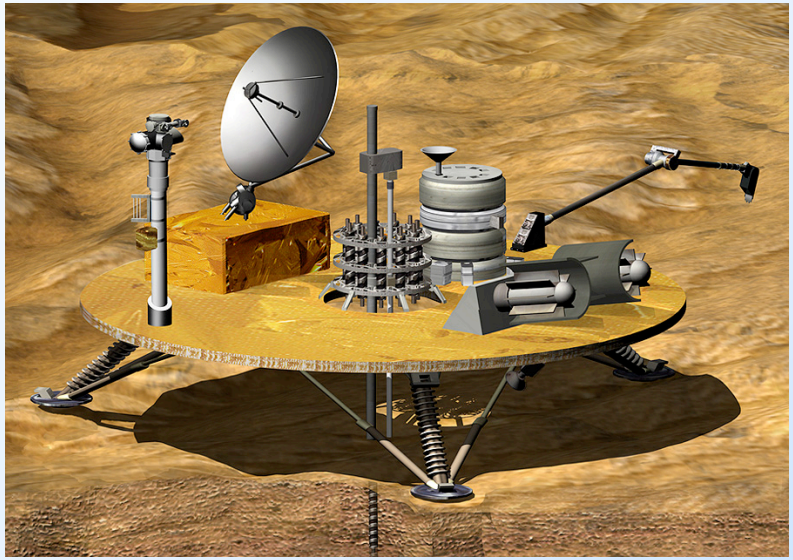
Pty	Goal IV Prepare for Humans
1	**Radiation environment**
	Demo hazard avoid, precision landing
	High-capacity power
2	**Bio/Chemical properties of soil & dust**
	Demo Mid L/D
	Communications infrastructure
3	Distribution of accessible water
	Demo high-Mach parachute
	Navigation infrastructure
4	**Atmospheric parameters**
	Demo ISCP/ISPP
5	Electrical effects in atmo
	Access and extract water
6	**Engineering properties of surface**
	Demo deep drilling
7	Radiation shielding of regolith
8	Ability of soil to support life
9	Characterize candidate sites
10	Fate of typical human effluents

Mars Deep Drill: Search for Past Life Mission*

- Scenario
  - Land at site thought to have been habitable for ancient life. Assume latitude between 30 S and 30 N. Altitude limited to 0 km (MOLA ref.).
  - Drill to at least 10 to 50 m (50 m used here) with continuous or frequent downhole science.
  - Frequently deliver samples to surface (50 samples minimum), including at depth.
    - All samples imaged. At least 50 samples analyzed.
  - Drill rate varies with rock characteristics and power
    - For this study, assumed 30 cm/hour average
  - Assume 4-sol repeatable cycle
    - 3 sols of drilling and sample retrieval @ 6 hrs/sol
    - 1 sol of analysis @ 6 hrs/sol
  - 176 sols allocated for drilling and sample analysis, including approx. 42 sols of drilling margin (50%). Additional 600 sols of post-drilling geophysical monitoring and 10 sols for startup.
- Trajectory
  - Type I
  - C_3 of 9.2 km^2/s^2
  - Flight time 8 months
  - Arrival V ~3.3 km/s
- LV: Delta IV 4040
  - LV Capability > 2160 kg at this C_3
- Launch Date
  - May 2018 (assumes 20 day launch period)
- Arrival Date
  - January 2019
  - Ls = 321 deg
- Geometry
  - Direct entry
  - 10 km landing error

* Data relevant to 2018 launch opportunity

Mars Deep Drill: Search for Past Life Spacecraft*



- Performance attributes
  - Precision Landing (10 km)
  - Power source
    - Generating ~110 W
  - Allocated Payload Mass = 324 kg
    - Includes: Drill w/ realignment & relocation systems (~225 kg) , Downhole & Surface Science, Sample Preparation & Distribution, Robotic Arm, PanCam
  - Autonomous drill operations
  - Planetary Protection category IVc

- Flight system elements
  - Lander
    - 800 kg wet, including payload
    - Design derived previous mission
  - Entry System
    - 492 kg wet
  - Cruise Stage
    - 337 kg wet
  - Total Launch Mass = 1629 kg

- Margins
  - 30% mass contingency
  - 30% power contingency
  - 30% (486 kg) launch margin

* Data relevant to 2018 launch opportunity

Mars Deep Drill: Search for Past Life Technology / Infrastructure*

- Critical Technology Needs [MEPAG #]
  - Autonomous deep drilling with low mass and power needs [177, 178, 183, 184]
  - Instruments
    - Down hole, e.g., ice/water detector; geophysical monitoring
    - Life-detection instrument(s)
  - Sample Preparation and Distribution (SPAD) System advances
  - Planetary Protection advances (IVc)
  - Phoenix and MSL: Precision landing (10 km) *[154]*
  - MSL
    - SPAD gen. 1
    - Long-term survivability
- Infrastructure Need
  - MTO or replacement telecom orbiter
- Technology cutoff FY14 (TRL 6)
  - PDR Nov. 2014
- Candidate Technology Demos for Future Missions
  - None identified to date
- Infrastructure feed forward
  - None identified to date

* Data relevant to 2018 launch opportunity

Mars Deep Drill: Search for Past Life Implementation*

- Implementation Mode
  - AO-supplied instruments
  - Drill competed
- Heritage Assumptions
  - Upgrade of previous mission flight elements
  - MSL: See previous chart
  - Design Maturity
    - Team X study August 2003, October 2001, November 1999; study of upgrade to Phoenix Mar. 2004
- Schedule
  - May 2018 Launch
  - 43 month Phase CD (starts Dec. 2014)
  - Information return begins January 2019

* Data relevant to 2018 launch opportunity